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(19) (CA) # CANADIAN PATENT (12)

(54) METHOD OF REINFORCING THE HANDLE OF A HOCKEY STICK

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No. OF CLAIMS 4

1043065 ABSTRACT OF THE DISCLOSURE

A method of reinforcing the handle of a hockey stick which results in the covering and adherence to the main faces of a hockey stick handle of a flat layer of synthetic resin in which reinforcing fibers are embedded, the same extending longitudinally of the handle. The handle itself is used as a male mold part in conjunction with an open top female mold part having straight sidewalls flaring upwardly from its bottom. A roving of reinforcing fibers impregnated with uncured thermosetting synthetic resin is laid longitudinally in the bottom of the mold. The handle is positioned in the mold with its longitudinal edges contacting the flaring sidewalls to close the mold, pressing the handle against the roving to cause flattening of the roving and resin and its adherence to the handle main face, heat curing the resin while in the mold and removing the handle from the female mold. The same operations are repeated for the other main face of the handle.

This invention relates to the art of hockey sticks and, more particularly, composite hockey sticks and to a method of reinforcing the handle thereof.

Reference is made to co-pending patent application by the same inventors, entitled: "COMPOSITE HOCKEY STICK", filed August 21, 1972, under Serial Number 149,909.

Composite hockey sticks with a reinforced handle have been proposed so far but with little consideration, if any, to the performance that these handles would be able to achieve with regard to their weight, cost and desired resilience. In particular, there has been proposed to cover all sides or faces of the handle of a hockey stick with a laminate facing secured by glue or adhesive. This appears to have been done inefficiently so far, in particular by failing to concurrently improve the weight and cost factors.

It is a general object of the present invention to provide a reinforced hockey stick handle having improved resilience characteristics and, in particular, a better balance between the resiliences in two planes orthogonally intersecting through the handle.

It is a more specific object of the present invention to provide an improved method of reinforcing the handle of a hockey stick by simultaneously molding and adhering to the faces of said handle a layer of resin-impregnated roving of longitudinally extending stress-resisting fibers and thus producing much finer end products than with previous "glue and adhesive" methods, while decreasing the need of finishing operations, such as sanding.

It is a more specific object of the invention to provide a method of reinforcing the handle of a hockey stick which simultaneously improves the handgrip.

It is another object of the invention to provide a method of reinforcing the handles of the hockey sticks, which results in dimension-

ally more uniform and straighter handles due to the molding action on the handle as well as on the lateral reinforcing layers, and in which the outer surfaces of the layers are smooth and uniform, providing surfaces

readily receiving printed matter.

The foregoing and other objects and advantages of the present invention will be better understood in the light of the following detailed description of preferred embodiments thereof which are illustrated, by way of example, in the accompanying drawings, wherein:

Figures 1 and 2 are transverse cross-sectional views through a mold before and after the molding operation respectively;

Figure 3 is a schematic illustration of the assembly to perform the molding on hockey stick handles according to the present invention;

Figure 4 is an enlarged cross-sectional view illustrating the operative relationship between a handle and a mold, both adapted to cooperatively produce an edge of predetermined cross-section for improved handgrip; and

Figures 5, 6, and 7 illustrate cross-sections of three distinct embodiments of handles of hockey sticks in accordance with the invention.

According to the present invention, handles of hockey sticks are reinforced in a mold 1 and using a press plate 2, both of which are elongated approximately the length of a handle of a hockey stick. The mold 1 may be fixedly mounted on any appropriate support, while the movable plate 2 is displaceable towards and away from the mold 1 by the action of one or more hydraulic cylinders 3 including a piston rod 4. The mold 1 has a pair of cavities 5 which are open at the top and which each has a transverse cross-sectional shape corresponding to the final cross-sectional shape of the handle of the hockey stick.

As can be seen in Figures 1, 2, and 4, the bottom of each cavity is transversely flat and the lateral side 6 flares upwardly towards the open top of the cavity to allow easy insertion and removal of the stick handle into and from the mold cavity 5. The press plate

2 is formed with a pair of flat surfaces 7 and 8, which are arranged in planes that are vertically spaced apart one from the other a distance equal to the desired thickness of a layer 9 of resin-covered reinforcing fibers.

Adjustment screws 10 are threaded through the press plate 2 and adapted to abut against the top of the mold 1, whereby selective screwing or unscrewing of these screws allows selective adjustment of the thickness of the layers 9. It is also possible to produce satisfactory molding without the use of adjustment screws by pushing press plate 2 with sufficient force against the stick handle to ensure proper distribution of the liquid thermosetting resin across the face of the stick handle.

According to the method of the present invention, the desired number of reinforcing fibers 11, such as glass fibers, are drawn from an appropriate supply thereof, indicated by three blocks 12 in Figure 3. These fibers 11 are then passed through a bath 13, of suitable resin, preferably a resin of the thermosetting type, which is also self-adhesive, such as to adhere itself to the handle of the hockey stick without use of a separate adhesive. The selected number of fibers, which have been covered with the resin, are thereafter joined to form a roving which is passed through a hole 14 of predetermined size in a plate 15, or the like, to remove excess resin.

The roving 16, of resin-covered reinforcing fibers, is thereafter laid longitudinally on the bottom of one cavity 5 to extend the full length thereof. After a roving 16 has been placed in each cavity 5, a hockey stick handle 17, of predetermined rectangular cross-section, is placed in each cavity with one of the two wider faces aligned to the blade of the hockey stick positioned substantially parallel to the bottom of the molding cavity 5.

It must be noted that in the cavity 5 underlying the surface 8, a

handle 17 having both wider faces made is placed, while in the other cavity 5, there is placed a handle 17 having one layer 9 already set against one wider face thereof, as shown in Figure 1.

A resilient strip, or cushion, such as rubber (not shown), may be laid over the top face of the handle 17. The press plate 2 is then lowered and pressed against the top face of handles 17; thus, the edges of the underface of the stick handle engage the sidewalls 6 of cavities 5 and seal the molding spaces formed by the cavities 5 and handles 17. The handles 17 press rovings 6 and cause their transversal flattening to completely fill the molding spaces, resulting in molded layers 9, as shown in Figure 2, which adhere to the corresponding face of the handle 17. Concurrently, the handles 17, which are preferably made of compressible material, such as wood, are correspondingly shaped by the face 6 of the mold to provide improved handgrip on the handle of the hockey sticks. The cavities 5 include bevelled corners 18 to form corresponding transversely bevelled edges along the opposite lateral edges of the layers 9.

The afore-mentioned cushions serve to insure more uniform spreading of these layers against the corresponding faces of the sticks.

As shown in Figure 4, the corners 18 may have different transverse outlines such as flat, concave, convex, etc.

Figure 5 illustrates a cross-section through the handle of a hockey stick wherein the core is made of plywood and more precisely of laminated wood including 7 central laminates 19, of poplar, two laminates 20, of birch, against each side of these 7 laminates, and one outer laminate 21, of poplar, against the exterior side of the laminates 20. In a closely related embodiment, not shown, the hockey stick may be made with a core of plywood or laminated wood, wherein the laminates extend transversely of the reinforcing layers instead of parallel thereto, as shown in Figure 5. This provides increased lateral rigidity even with a

relatively reduced quantity of reinforcing fibers.

In the embodiment of Figure 6, the handle 17 is made of foam plastics which is provided with the layers 9 but with the latter having cornering projections 22 which provide the necessary rigidity and resilience in the direction of the layers 9.

In the embodiment of Figure 7, the core 17 is again made of foam plastics but, this time, the rigidity and resilience in the direction of the layers 9 are assured by molding layers 29 against the other two sides of the handle 17.

It must be noted that any of the above-mentioned types of hockey stick handle may be covered with any of the afore-mentioned types of layers 9 with or without concurrent molding of the handle 17 and with any suitable shape of the bevel 18.

The handle 17 may be made either of soft wood or low grade hardwood, such as for basswood, which is as light as a soft wood, such as pine. The laminated core with poplar laminates has more torsional force, requires less fibers and resin to produce a comparable hockey stick handle, and of more uniform quality.

The conventional hockey stick handle, made of ash wood, is twice as rigid in the plane of the blade than in the orthogonal plane relative to the latter. By using various combinations of low density wood, such as poplar or rigid foams, with high density and of high rigidity wood, such as birch as laminates in the handle, together with various amounts of reinforcing fibers and resin laterally of this handle, the rigidity of the handle can be widely varied while maintaining within acceptable limits cross-sectional dimensions of the handle and the weight of the stick.

After the press plate 2 has pressed the handle 17 against the roving 16 and flattened the latter, the layer 9 thus formed is thermoset by heating for a few minutes, causing hardening of the resin and firm

adherence thereof against the handle 17. The press plate 2 is thereafter raised and the stick, or sticks, are removed. The incomplete stick is turned flat on the other side and placed in the other cavity 5 to replace the completed stick, which is removed and finished by simple trimming of the ends of the layers 9. Layers 9 have a smooth outer face suitable for printing thereon.

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SUPPLEMENTARY DISCLOSURE

It has been found that a much better adherence can be obtained between the wooden core of the hockey stick handle and the layer of thermosetting resin, preferably a polyester resin, if, prior to the moulding of the layer, the wooden core is heated to a temperature of about 150°F. during two to six minutes and, preferably, three to four minutes. Not only the heated wooden core helps in the thermosetting of the resin, but also any humidity in the wood outer surface is dried out, whereby better adherence is obtained.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED, ARE DEFINED AS FOLLOWS:

1- The method of reinforcing the handle of a hockey stick, said handle made of a compressible material selected from the group consisting of wood and foam plastic, comprising the steps of laying a roving of reinforcing fibers impregnated with uncured thermosetting synthetic resin longitudinally in the flat bottom of an elongated open top female mold having straight side walls flaring upwardly from said bottom, said resin capable of directly adhering to said handle and of wetting said fibers, using the handle of a hockey stick as a male molding part, said handle having a substantially rectangular cross-section defining a pair of wider main faces and a pair of narrower end faces, positioning said handle longitudinally in said mold and with one main face of said handle substantially parallel to said bottom and with the longitudinal edges of said main face abutting the respective side walls of said mold and retaining said main face spaced from said bottom, thereby defining a molding space between said female mold and said handle, pressing said handle towards said bottom and against said roving to cause said side walls to engage said narrower end faces of said handle and compress said handle and seal said molding space along said side walls, and to cause said roving and resin to flatten and to fill said molding space and to adhere to said handle main face, heat curing said resin, removing said handle from said female mold with the cured resin forming a flat layer covering and adhering to said main face, and said layer having said fibers embedded therein and longitudinally extending along said handle.

2- A method as claimed in claim 1, wherein said female mold has corner faces at the junction of said bottom and of said

side walls which are inclined relative to said bottom and side walls, the resulting flat layer having bevelled longitudinal edges.

CLAIMS SUPPORTED BY THE SUPPLEMENTARY DISCLOSURE

3SD- A method as claimed in claim 1, wherein said handle is made of wood and including heating said handle prior to laying the same against said roving.

4SD- A method as claimed in claim 1, wherein said handle is made of wood and is heated to about 150 degrees Farenheit for at least two minutes before laying the same against said roving.

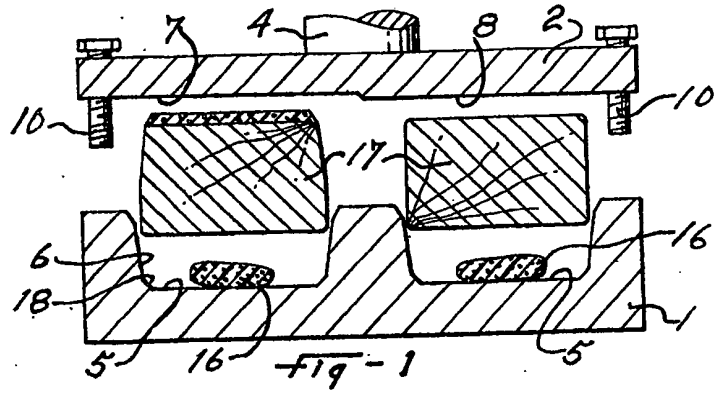

Fig - 1

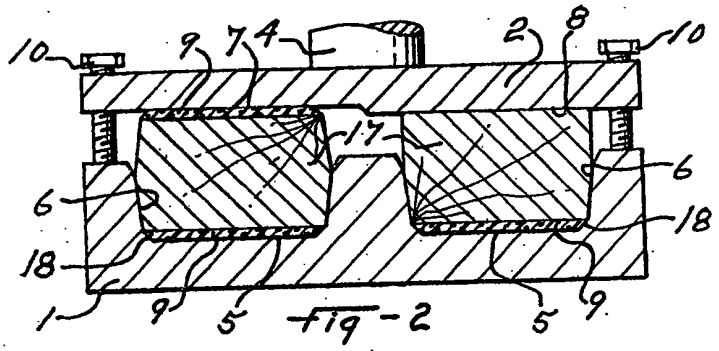

Fig - 2

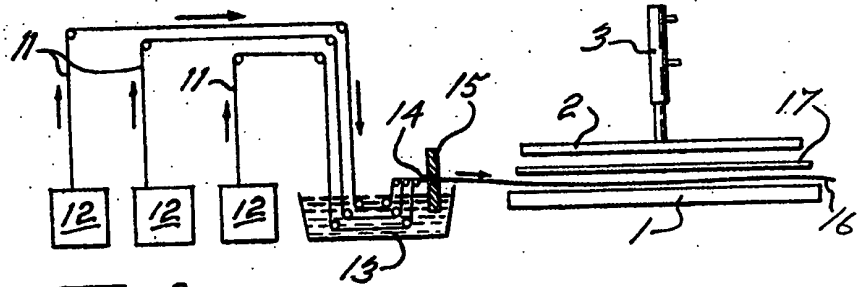

Fig - 3

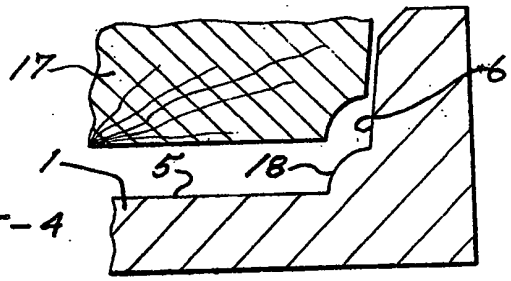

Fig - 4

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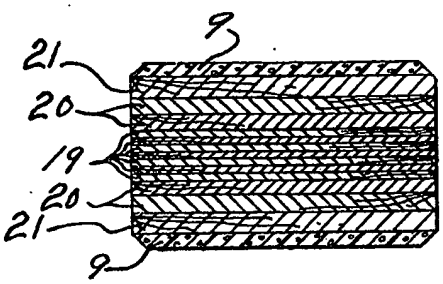

fig - 5

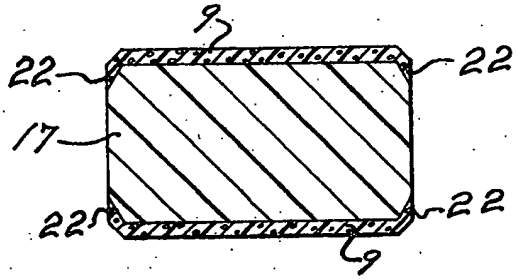

fig - 6

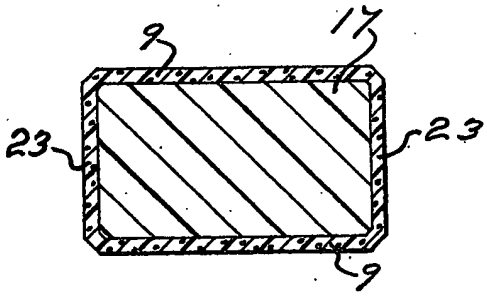

fig - 7

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